



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

THE PATHOLOGY OF DERMATITIS VENENATA FROM RHUS DIVERSILOBA *

JAMES B. MCNAIR

From the Rudolph Spreckels Physiological Laboratory of the University of California, Berkeley

The effect produced by the poisonous sap of poison oak (*Rhus diversiloba* T. & G.) on the human skin is that of an inflammatory process in the cutaneous tissues of several degrees of intensity. For entrance the poison makes use of all possible channels—the sudoriparous and sebaceous ducts, the hair follicles, and even the surface of the skin itself (see Figs. 1 and 2). Poisoning may occur at any time of the year, but it is most frequent at Berkeley during February, March, and April, as demonstrated by frequency polygons.

The principal lesions of this form of dermatitis have been minutely described by White.¹ The primary lesions are erythema, hyperemic macules, papules, vesicles, and pustules. These may occur as progressive steps in well-defined stages, or they may arise independently and subside without undergoing any further evolutionary change. They may all be present at the same time, or any one may constitute the entire process. The secondary lesions are scale, excoriation, ulcer, and cicatrix. These may take place incident to the decline of the inflammation, or as a result of an accidental interference with its natural course. The subjective symptoms are usually itching and burning in the affected parts. In severe cases this may be intensified to a burning stinging heat, and the torture be so great as to deprive the patient of sleep and require the administration of narcotics.

In this investigation, a microscopical examination of sections of diseased human skin disclosed many leukocytes, among which the mononuclear cells predominated. From this it was thought that leukocytosis might be numbered among the symptoms. The swelling of the lymphatic glands near the affected parts, which is so frequently observed in connection with *Rhus* poisoning, strengthens the probability of its being a phenomenon of adsorption. Investigation showed leukocytosis to be a regular accompaniment of the severer cases from poison oak (see figures). The severity of the leukocytosis seemed to vary directly with the size of the area involved and the severity of the infection. For instance, in a case in which the face, hands, arms, and chest were severely affected a blood count showed 31,600 leukocytes to

* Received for publication April 1, 1916.

¹ *Dermatitis Venenata*, 1887.

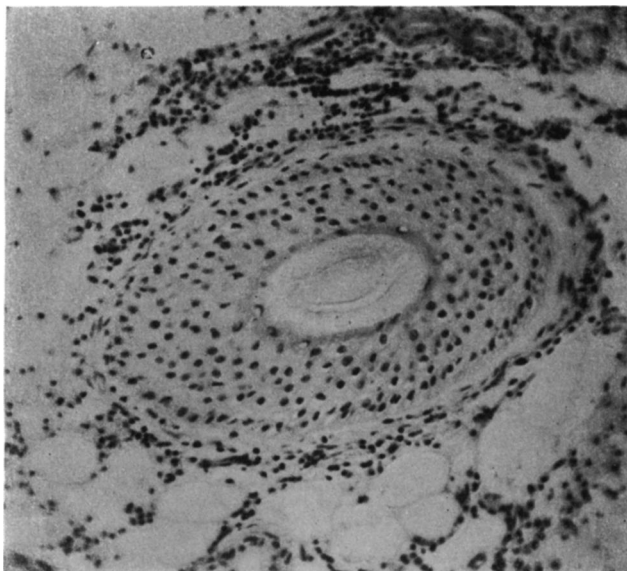


Fig. 1. Section of skin affected by poison oak showing infiltration of leukocytes around a hair follicle. $\times 190$.

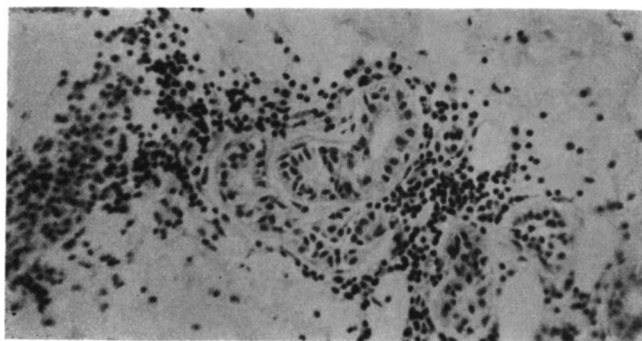


Fig. 2. Section of skin affected by poison oak showing infiltration of leukocytes around a sudoriparous gland. $\times 190$.

the cubic millimeter. In a milder case in which only one forearm was affected, 14,000 leukocytes were found to the cubic millimeter of blood. Blood counts frequently indicated the presence of more than 12,000 leukocytes to the cubic millimeter.

Constitutional disturbances may accompany violent cases. The highest body temperature recorded of 45 bed patients was 37.5 C. There is sometimes a slight febrile condition with coated tongue, loss of appetite, and constipation.

As the poison of *Rhus toxicodendron*, a closely related plant, will produce albuminuria in rabbits,² it was thought that the poison of *Rhus diversiloba* might cause similar symptoms. With this in view 5 c.c. of the poisonous sap mixed with 15 c.c. of cottonseed oil were introduced per os into a rabbit weighing 3,171 gm. A test for albumin in the urine was found positive 4 hours after the poison was introduced. Hence it was thought albuminuria might occur in severe dermatitis in men. The urine from 28 severe bed cases was examined. All gave negative reactions for sugar. Nineteen, or 68%, were negative with respect to albumin, and 9, or 32%, were positive. One of the patients having albuminuria developed, and recovered from, acute nephritis simultaneously with dermatitis; the rest of the patients showed but faint traces of albumin in the urine.

Tables 1 and 2 describe the case involving a simultaneous acute nephritis.

TABLE 1
URINE IN WHICH ALBUMIN WAS PRESENT

Sp. Gr.	Color	Appearance	Reaction	Sugar	Albumin
1.012	Straw	Cloudy	Acid	0	Trace
	Light amber	Cloudy	Acid	0	Trace
1.015	Straw	Cloudy	Acid	0	Trace
1.023	Amber	Clear	Acid	0	Trace
1.009	Straw	Clear	Acid	0	Trace
1.032	Amber	Cloudy	Acid	0	Trace
1.018	Amber	Cloudy	Alkaline	0	Trace
			Alkaline	0	Trace
1.008	Amber	Clear	Neutral	0	Trace

The poison in the urine could not be detected in a free condition. Three liters of urine were shaken up with ether, and the ethereal layer separated and concentrated by evaporation. This ethereal extract did not give any chemical reaction for the poison, and when concentrated by evaporation and applied to the skin of a sensitive person, it did not cause dermatitis.

² Pfaff: Jour. Exper. Med., 1897, 2, p. 192.

The urine was not abnormal in color, as is sometimes the case when phenol¹ or pyrogallol is externally applied.⁴ The urine had no abnormal odor, such as is noticeable upon the inunction of turpentine or drugs of that series.⁵

TABLE 2
DERMATITIS VENENATA AND ACUTE NEPHRITIS

Time	Temperature, C.	Pulse	Respiration	Analysis of Urine				
				Sp. Gr.	Color	Appearance	Reaction	Albumin
1st day a. m.	36.6	70	16	1.015	Amber	Cloudy	Acid	0.0025 Esbac
2nd day a. m.	36.6	64	18	1.013	Straw	Clear	Neutral	0.006
p. m.	36.9	74	16					
3rd day a. m.	36.4	64	18					
p. m.	36.6	80	16					
4th day a. m.	36.6	68	18	1.015	Amber	Clear	Acid	Fairly large amount
p. m.	36.4	68	18					
5th day a. m.	36.6	84	18	1.013	Amber	Clear	Acid	Fairly large amount
p. m.	36.4	68	18	1.031	Amber	Cloudy	Acid	0.0025
6th day a. m.	36.4	72	18	Cloudy	Acid	Trace
p. m.	36.5	80	16					
p. m.	36.4	68	18					
7th day a. m.	36.4	68	18	1.036	Acid	Trace
p. m.	37.0	68	16					
8th day a. m.	36.6	68	18					
p. m.	37.0	72	18					
9th day a. m.	36.6	68	18	1.023	Amber	Cloudy	Alkaline	Trace

White blood counts: 1st day, polymorphonuclear 64%, small mononuclear 20%, large mononuclear 6%, eosinophils 10%; 7th day, polymorphonuclear 57% small mononuclear 35%, large mononuclear 6%, eosinophils 2%. Total count 13,600.

Heart: Slightly enlarged, action accentuated, premature contraction, otherwise regular, sounds strong; soft systolic at left sternal edge. No edema in ankles. Slight edema in upper and lower eyelids, due at least partly to poison oak. Blood pressure 110. Assythema (asystoles) continues.

Urine: Epithelial casts and cells; no pus.

The seat of the inflammation comprises those parts of the integument which have been in direct contact with the sap of the plant. The parts left unprotected by clothing are generally first affected. The examination of over 1,000 dispensary cases indicates that the parts most usually affected are the backs of the hands, the insides of the forearms, the eyes, ears, and genitalia. Sometimes, however, the eruption is spread by the hands or clothing to other parts of the body. Certain regions are more susceptible than others to the irritant influence; e. g., the face and genitalia, and, indeed, wherever the skin

¹ Köster-Syke: Deutsch. med. Ztg., 1886, 34, p. 381. Browne: Brit. Med. Jour., 1885, 2, p. 692. Dreyfous: Abstracted in L'Union méd. du Canada, 1885, 14, p. 226. Penasse: Jour. de méd. de Paris, 1886, 10, p. 760. Rose: Verhandl. d. Gesellsch. d. Aerzte, 1884. Brun: These de Paris, 1886.

⁴ Jarisch: Wien Med. Jahrb., 1878, No. 4. Allen: Jour. Cut. Dis., Incl. Syph., 1886, 4, p. 8.

⁵ Brochin: Gaz. d. Hôp., 1879, 52, p. 99. Berenguier: These de Paris, 1874. Garland: Lancet, 1886, 1, p. 1005.

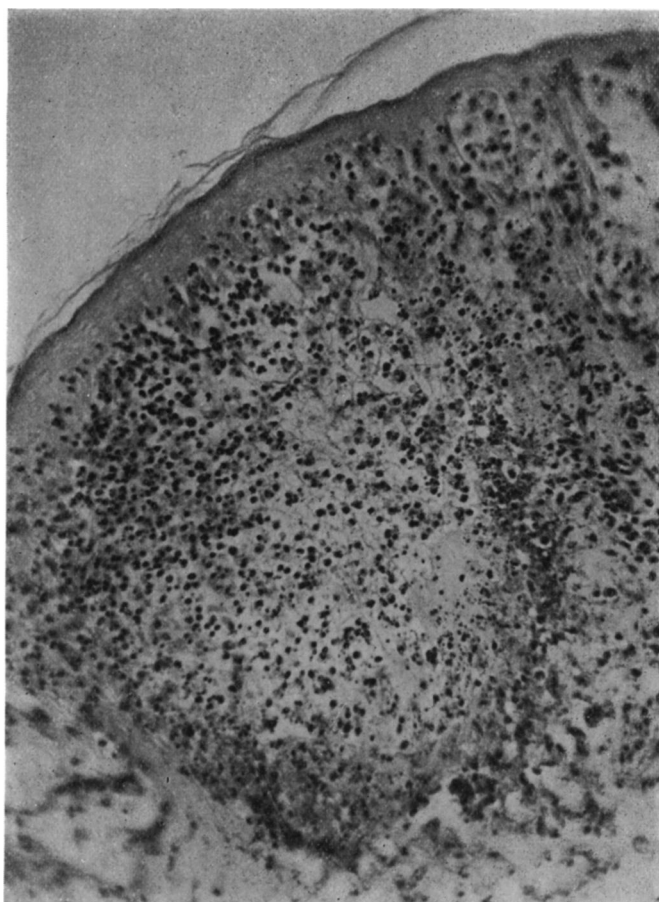


Fig. 3. Section of skin affected by poison oak showing vesicle, infiltration of leukocytes, and slowly diffusible character of the poison. $\times 190$.

is thin and delicate. The sticky resinous sap is seldom able to penetrate the thick horny surface of the hands, but it may be spread by them to other parts of the body, e. g., to the genitalia.

The course of the affection is often acute. Within 12 hours after exposure patients frequently break out with a rash. This latent period, or period of incubation, is dependent on the slow diffusibility of the poison into and within the skin, as well as on the predisposition of the individual. The slow diffusibility is evident in microscopical examination (see Figs 3 and 4). The acute symptoms usually subside within from 4 to 6 days. The intensity of the dermatitis depends on the amount of the irritant, and the sensitiveness of the skin; on the author the sap, when well rubbed into the skin of the forearm, produces only

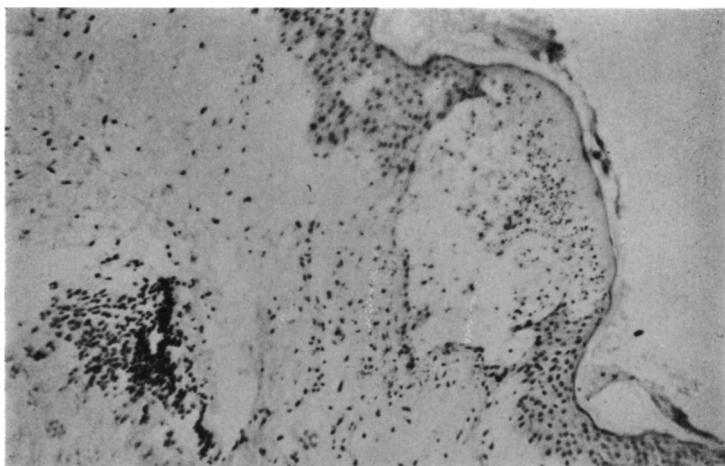


Fig. 4. Section of skin affected by poison oak showing vesicle, infiltration of leukocytes, and slowly diffusible character of the poison.

redness, a slight swelling, and very little pain. The secondary infections of the poison, those caused by its transference from the original place of contact, are always slighter in degree of inflammation, unless the area of the skin is thinner and consequently more sensitive to the poison. This peculiarity is of value in diagnosis. In this connection it should be borne in mind that the exudation from the broken vesicles or papules is nontoxic even when rubbed into the scratched skin of a very susceptible individual. The nontoxicity of the vesicular exudate from this dermatitis is in accordance with the results obtained by White,¹ Van Adelung⁶ and Rost and Gilg⁷ with *Rhus toxicodendron*.

⁶ Arch. Int. Med., 1913, 2, p. 184.

⁷ Ber. d. deutsch. pharm. Gesellsch., 1912, 22, p. 296.

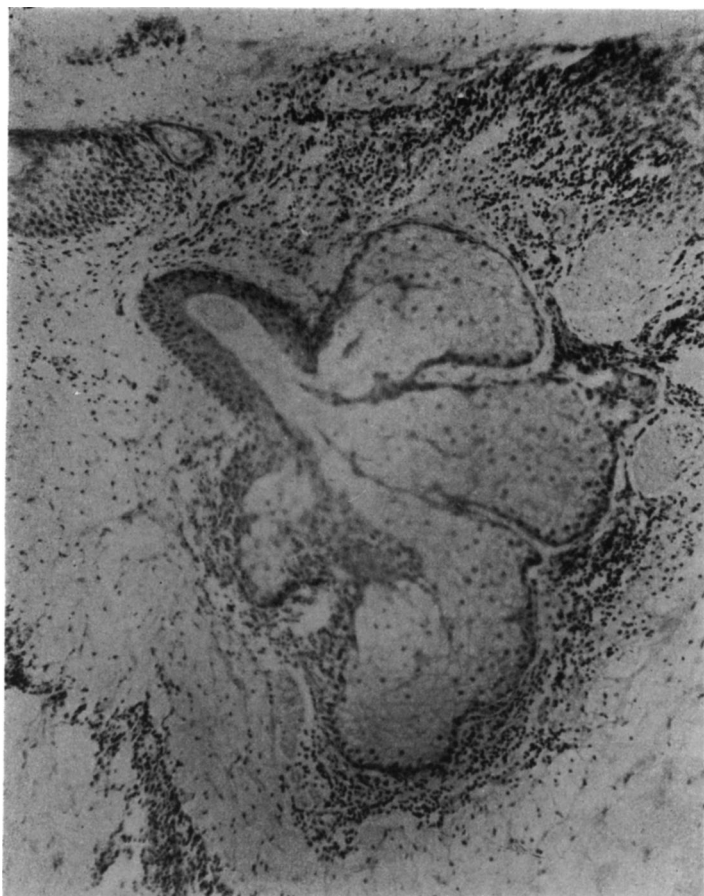


Fig. 5. Section of skin affected by poison oak showing sebaceous gland and infiltration of leukocytes. $\times 100$.

It may occasionally be difficult to reach a positive diagnosis at first, as between this type of dermatitis venenata and other forms, including eczema. A history of the onset, occupation, and exposure will be of aid. *Rhus-diversiloba* poisoning frequently begins between the fingers, is markedly acute in character, with a good deal of swelling, and often large vesicles and blebs appear; the latter are rarely seen in eczema. The distribution and configuration of the eruption show certain peculiarities. It often occurs in sharply defined patches, elongated streaks, or irregular shapes as marked out by the original contact with the plant. In distinction from herpes, poison-oak dermatitis does not follow the nerve trunks. Unlike eczema, it seldom attacks the inside of the hands



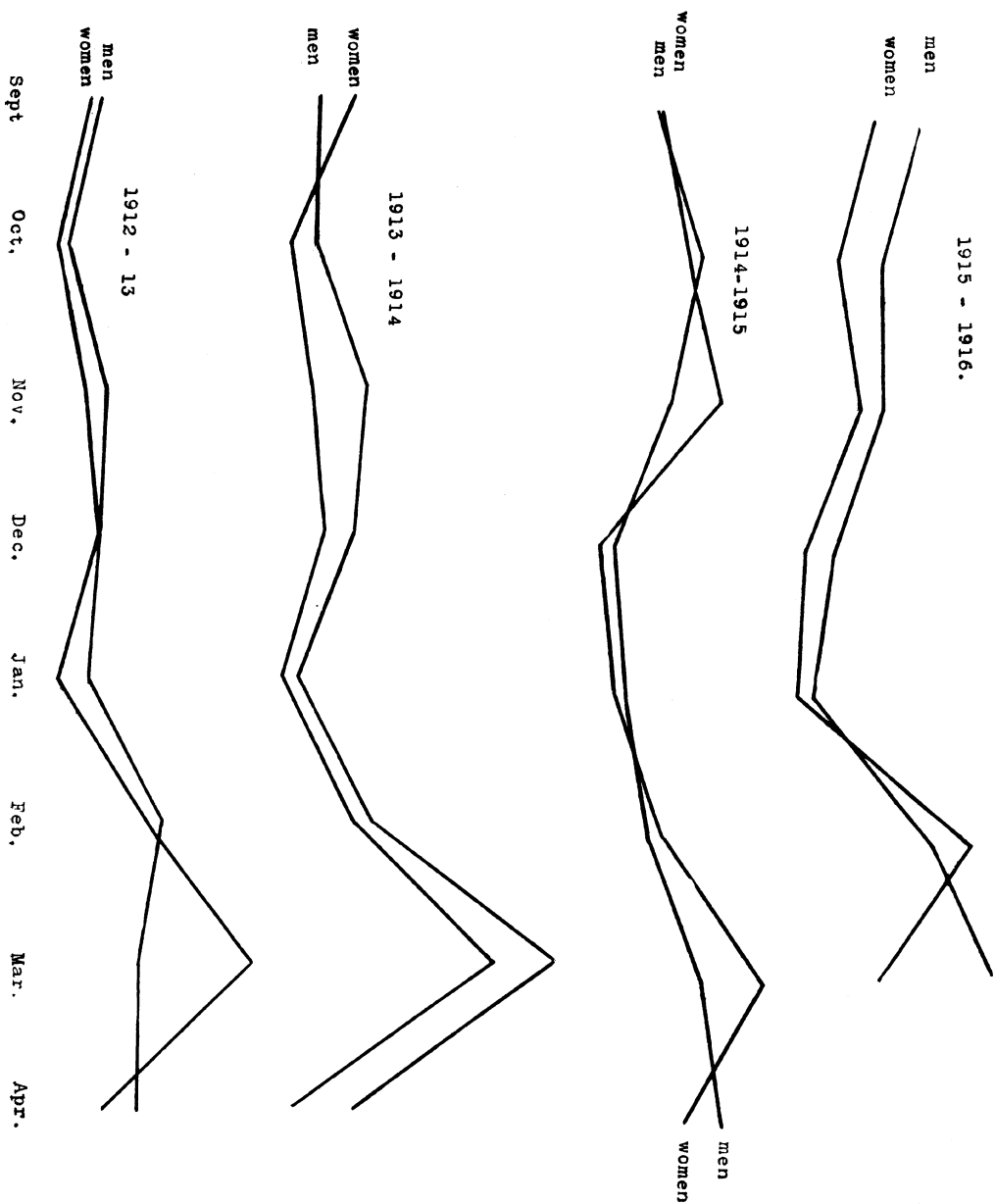
Fig. 6. Section of skin affected by poison oak showing sebaceous gland and infiltration of leukocytes. $\times 100$.

or the scalp. The marked increase in leukocytes, together with the lack of a disproportionate change in polymorphonuclear leukocytes, distinguishes it from the polymorphonuclear character of the dermatitis from turpentine and croton oil, and from the pustular character of dermatitis due to antimony,⁸ aconite,⁹ and cantharides.¹⁰

⁸ Trousseau: *Treatise on Therapeutics*, 1880, 2, p. 139. Ringer: *Handbook of Therapeutics*, 1897, p. 210. Stille: *Materia Medica and Therapeutics*, 1874, 2, p. 423. Simeons: *Gaz. méd. de Paris*, 1848, p. 192.

⁹ Dierbach: *Piffard's Materia Medica and Therapeutics of the Skin*, 1881, p. 12. Farquharson: *Brit. Med. Jour.*, 1879, 1, p. 267. Ringer: *Handbook of Therapeutics*, 1897, p. 397. Stille: *Materia Medica and Therapeutics*, 1874, 2, p. 310.

¹⁰ Trousseau: *Treatise on Therapeutics*, 1880, p. 262. Morrow: *Piffard's Materia Medica and Therapeutics of the Skin*, 1881, p. 38. Dierbach: *Ibid.* Pereira: *Hughes' Manual of Pharmacodynamics*, 1876, p. 244.



Frequency polygons of the number of cases of Rhus dermatitis at Berkeley, California.

The acuteness, rather violent characteristics, and distribution of the eruption, together with a history of possible exposure, make up an ordinarily conclusive picture.

SUMMARY

The sap of poison oak (*Rhus diversiloba* T. & G.) contains a slowly diffusible skin irritant.

This irritant makes entrance through the sudoriparous and sebaceous ducts, the hair follicles, and through the skin itself.

It produces a dermatitis in many ways similar to many other forms of dermatitis venenata.

Slight constitutional disturbances may take place; a temperature of 37.5 C.; sometimes a febrile condition involving a coated tongue, loss of appetite, and constipation. The urine may have a trace of albumin. One case of acute nephritis is recorded. Sugar has never been noticed.

The seat of inflammation involves that part of the integument which comes in contact with the poison. In over 1,000 cases the backs of the hands, the inside of the forearms, the eyes, ears, and genitalia have been thus involved. The vesicular exudate is nontoxic.

The course of the affection is often acute. It usually reaches its maximum within several days after exposure and may subside within from 4 to 6 days.

Diagnosis may occasionally be difficult. History of the onset, occupation, and exposure is useful. Peculiarities may be noticed in the distribution and configuration of the eruption in distinction from eczema and herpes.